

## CLAIMS

- 1     1.     A method for proxying data access commands from a first storage system to a  
2     second storage system in a storage system cluster, the method comprising the steps of:  
3             receiving a data access command at the first storage system that is directed to the  
4     second storage system;  
5             forwarding the received data access command to the second storage system via a  
6     cluster interconnect;  
7             processing the data access command at the second storage system;  
8             returning a response from the second storage system to the first storage system via  
9     the cluster interconnect; and  
10            sending a response to the data access command to the client from the first storage  
11     system.
- 1     2.     The method of claim 1 wherein the storage systems are storage appliances and  
2     wherein the data access command is received at a proxy port associated with the first  
3     storage appliance.
- 1     3.     The method of claim 2 wherein the proxy port comprises a physical port.
- 1     4.     The method of claim 2 wherein the proxy port comprises a virtual port associated  
2     with a physical port.
- 1     5.     The method of claim 1 wherein the response comprises requested read data.
- 1     6.     The method of claim 1 wherein the response comprises an acknowledgement of a  
2     write operation.
- 1     7.     The method of claim 1 wherein the response comprises a predetermined set of  
2     read data.

- 1 8. The method of claim 1 wherein the cluster interconnect comprises a direct link  
2 between the first storage system and the second storage system.
- 1 9. A system adapted to proxy data access commands from a first storage system to a  
2 second storage system connected via a cluster interconnect, the system comprising:  
3 a virtual target layer interfacing with a virtual adapter on the first storage system,  
4 the virtual target module adapted to make a forwarding decision of a received data access  
5 request to thereby forward the request to the second storage system.
- 1 10. The system of claim 9 wherein the forwarding decision is based on a port to  
2 which the data access request is directed.
- 1 11. The system of claim 10 wherein the forwarding decision is based upon a logical  
2 unit address contained within the data access request.
- 1 12. A storage appliance for use in a storage appliance cluster for proxying data access  
2 commands received at the storage appliance to a second storage appliance in a storage  
3 appliance cluster, the storage appliance comprising:  
4 a storage operating system executing on the storage appliance, the storage oper-  
5 ating system including a virtual target module adapted to forward received data access  
6 commands to the second storage appliance in the storage appliance cluster.
- 1 13. The storage appliance of claim 12 wherein the storage operating system further  
2 comprising a virtual adapter that interfaces with the virtual target module and an inter-  
3 connect driver for forwarding the received data access commands from the virtual target  
4 module to the second storage appliance via a cluster interconnect managed by the inter-  
5 connect driver.

1 14. The storage appliance of claim 13 wherein the cluster interconnect comprises a  
2 fibre channel interconnect.

1 15. The storage appliance of claim 13 wherein the cluster interconnect directly con-  
2 nects the storage appliance to the second storage appliance.

1 16. The storage appliance of claim 12 wherein the virtual adapter interfaces with a  
2 virtual interface emulation layer to provide remote direct memory access capabilities for  
3 transferring or forwarding received data access commands to the second storage appli-  
4 ance.

1 17. A method for proxying data access commands in the first storage system to a sec-  
2 ond system in a storage system cluster, the method comprising the steps of:  
3 analyzing a received data access command at the first storage system,;  
4 forwarding the received data access command to the second storage system; and  
5 processing the received data access command at the second storage system.

1 18. The method of claim 17 further comprising the steps of;  
2 returning a response from the second storage system to the first storage system;  
3 and  
4 sending a response to the data access command to the client from the first storage  
5 system.

1 19. The method of claim 17 wherein the step of forwarding further comprises the step  
2 of forwarding the data access command to the second storage system via a cluster inter-  
3 connect.

1 20. The method of claim 19 wherein the cluster interconnect comprises a fibre chan-  
2 nel link.

1 21. The method of claim 19 wherein the cluster interconnect comprises a direct link  
2 between the first storage system and the second storage system.

1 22. The method of claim 17 further comprising the step of receiving the data access  
2 command is at a proxy port of the first storage system.

1 23. The method of claim 22 wherein the proxy port comprises a physical port.

1 24. The method of claim 22 wherein the proxy port comprises a virtual port associ-  
2 ated with the physical port.

1 25. The method of claim 18 wherein the response comprises requested read data.

1 26. The method of claim 18 wherein the response comprises an acknowledgement of  
2 the write operation.

1 27. A computer readable medium, including program instructions executing on a  
2 computer, for proxying data access commands from a first storage system to a second  
3 storage system in a storage system cluster, the computer readable medium including in-  
4 structions for performing the steps of:

5 receiving a data access command at the first storage system that is directed to the  
6 second storage system;

7 forwarding the received data access command to the second storage system via a  
8 cluster interconnect;

9 processing the data access command at the second storage system;

10 returning a response from the second storage system to the first storage system via  
11 the cluster interconnect; and

12 sending a response to the data access command to the client from the first storage  
13 system.

1 28. A system for proxying data access commands from a first storage system to a sec-  
2 ond storage system connected via a cluster interconnect, the system comprising:  
3 means for receiving a data access command at the first storage system that is di-  
4 rected to the second storage system;  
5 means for forwarding the received data access command to the second storage  
6 system via a cluster interconnect;  
7 means for processing the data access command at the second storage system;  
8 means for returning a response from the second storage system to the first storage  
9 system via the cluster interconnect; and  
10 means for sending a response to the data access command to the client from the  
11 first storage system.

1 29. The method of claim 28 wherein storage systems are storage appliances and the  
2 data access command is received at a proxy port associated with the first storage appli-  
3 ance.

1 30. The method of claim 29 wherein the proxy port comprises a physical port.

1 31. The method of claim 29 wherein the proxy port comprises a virtual port associ-  
2 ated with a physical port.

1 32. The method of claim 28 wherein the response comprises requested read data.

1 33. The method of claim 28 wherein the response comprises an acknowledgement of  
2 a write operation.

1 34. The method of claim 28 wherein the response comprises a predetermined set of  
2 read data.